Impact assessment of alternative smart specialization policies for Hungarian NUTS 3 regions

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Outline

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- Economic impact assessment of smart specialisation policies
- Economic models for impact assessment
- The GMR-Hungary policy impact assessment model
- Illustrative policy simulations
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Introduction

- Cohesion Policy 2014-2020: regional smart specialisation strategies (S3) become a condition for ERDF funding
- Smart specialisation policy aims at supporting growth by enabling each region to identify and develop its own competitive advantages
- S3 is a bottom-up development concept: pockets of potential future innovations (discoveries) developed by entrepreneurs may result in a change of the region's future industrial structure
- Government: selects from alternatives (prioritisation) for policy support
- The method suggested in the S3 literature for economic impact assessment of the discoveries needs further development
- This presentation argues that economic impact models can play a significant role in the assessment of smart specialisation policies

Economic impact assessment in the selection from alternative discoveries

- Economic impact assessment: the estimation of the likely impacts of S3 on variables (like GDP, employment or wages) at the regional and supra-regional levels
- The suggested approach for economic impact assessment in the smart specialisation literature: estimation of ‘direct and indirect resource inputs from both the private and public sector suppliers’ (Foray et al. 2011, p. 13).
- This approach identifies impacts with the so-called “backward linkages”.
- However this approach covers impacts only partially

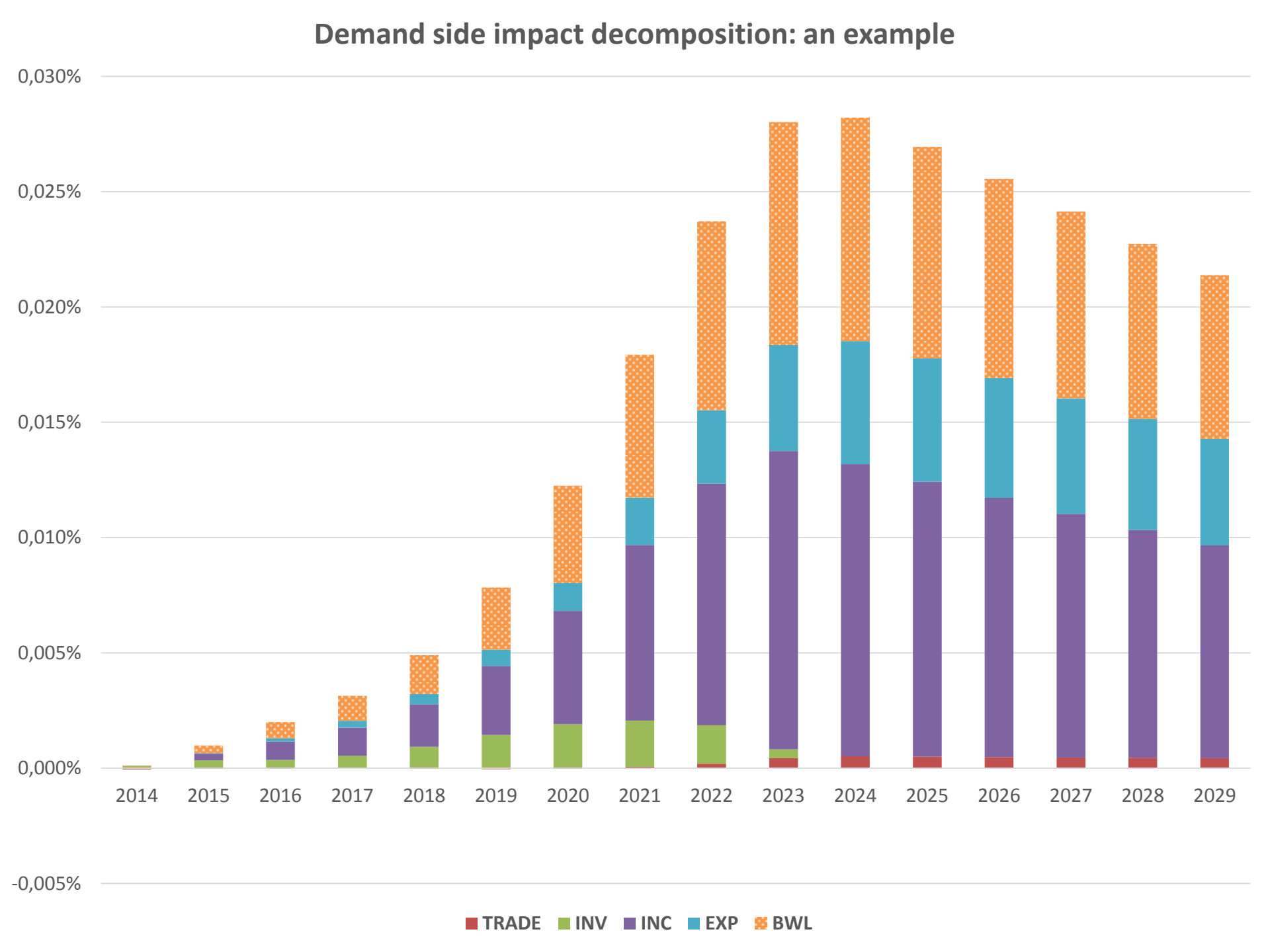
Structural decompositon analysis[1]

- A comparative static method to identify the factors that contribute to sectoral/regional/national growth
- Numerical calculation of the amount of their contribution to total impact based on I-O data
- The demand side approach aims to break down aggregate output growth into changes in final demand, purchase structure

[1]Rose-Casler (1996), Dietzenbacher-Los (1998), Miller-Blair (2009)

Decomposition of the demand-side impact of a policy supporting a particular industry (investment subsidy)

1) **Backward linkages**
   - The indirect effects of policy shock throught input-output linkages between industries
2) **Investment demand effect**
   - The impact of increased investment demand on output
3) **Income effect**
   - The effects of increased capital income, indirect tax revenues and savings
4) Changes in **interregional trade**
   - The effects of increased domestic demand outside the region for local goods (as a result of higher local productivity)
5) Changes in **international trade**
   - The effects of increased foreign demand for local goods (as a result of higher local productivity)


Demand side impact decomposition: an example
0,030%
0,025%
0,020%
0,015%
0,010%
0,005%
0,000%
-0,005%
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
TRADE
INV
INC
EXP
BWL

Economic models for S3 impact assessment

- Much broader economic impacts can be estimated with economic models
- Suitable economic impact models should incorporate
  - the regional dimension (S3 interventions address regional development)
  - interregional interactions (trade, migration, technology spillovers)
  - industrial dimension of the regional economy (S3 interventions address selected industrial sectors)
- With multi-regional, multi-sectoral models the economic impacts of different development scenarios became comparable both at the regional and at the supra-regional levels

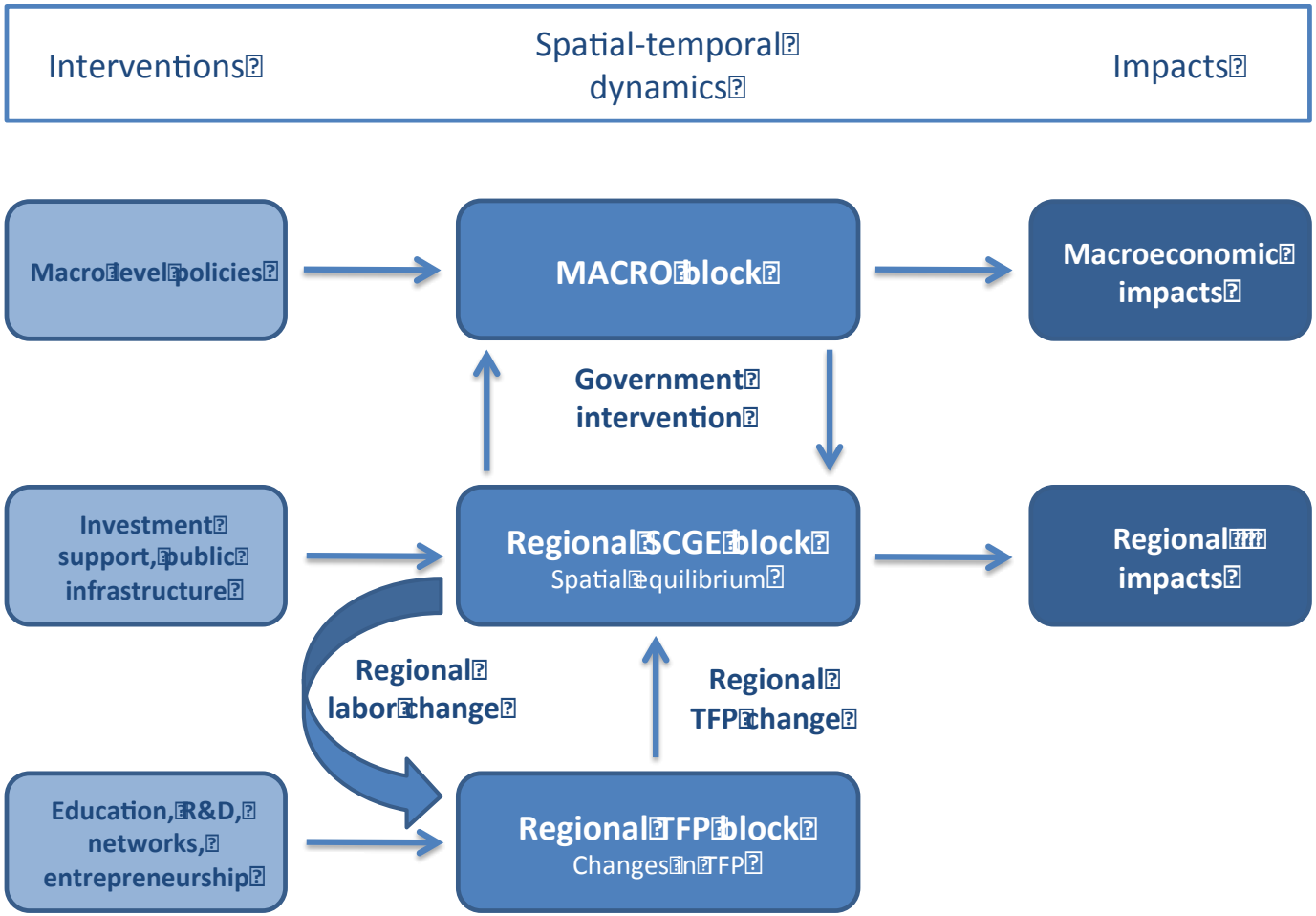
The GMR-Hungary policy impact assessment model

- **GMR**: Geographic Macro and Regional model

- GMR-models: EcoRET model (Varga, Schalk 2004), GMR-Hungary (Varga 2007, Varga, Járosi, Sebestyén 2013), GMR-Europe (Varga 2017, Varga, Járosi, Sebestyén, Szeb 2015), GMR-Turkey (Varga, Baypinar 2016)

- Selected applications:
  - Cohesion Policy impact assessment for the Hungarian government (since 2004 continuously)
  - Cohesion Policy impact assessment for the European Commission (DG Regio, 2011)
  - FP6 impact assessment (2010)
  - policy impact assessment on Turkish regions (2014)

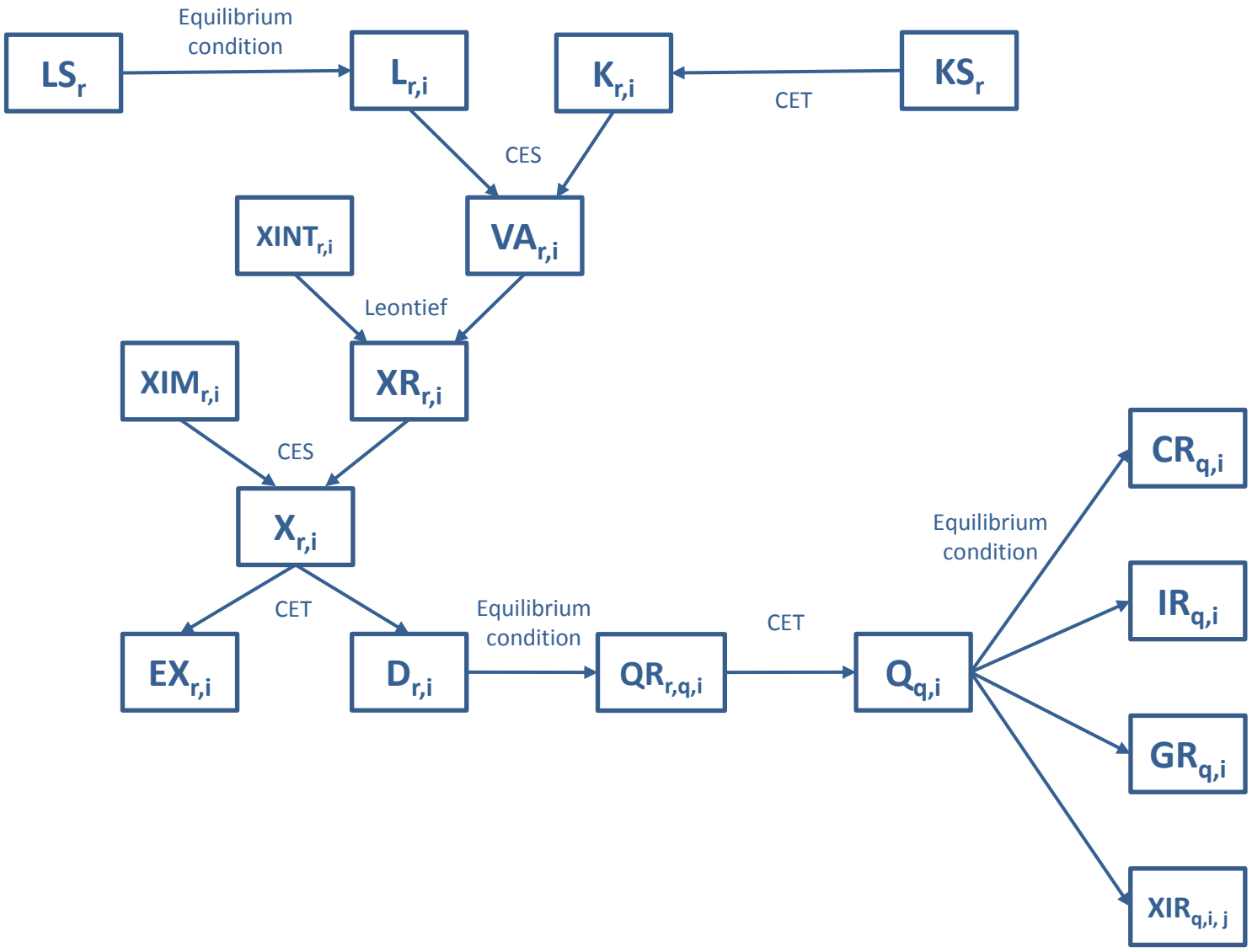
The GMR-Hungary model



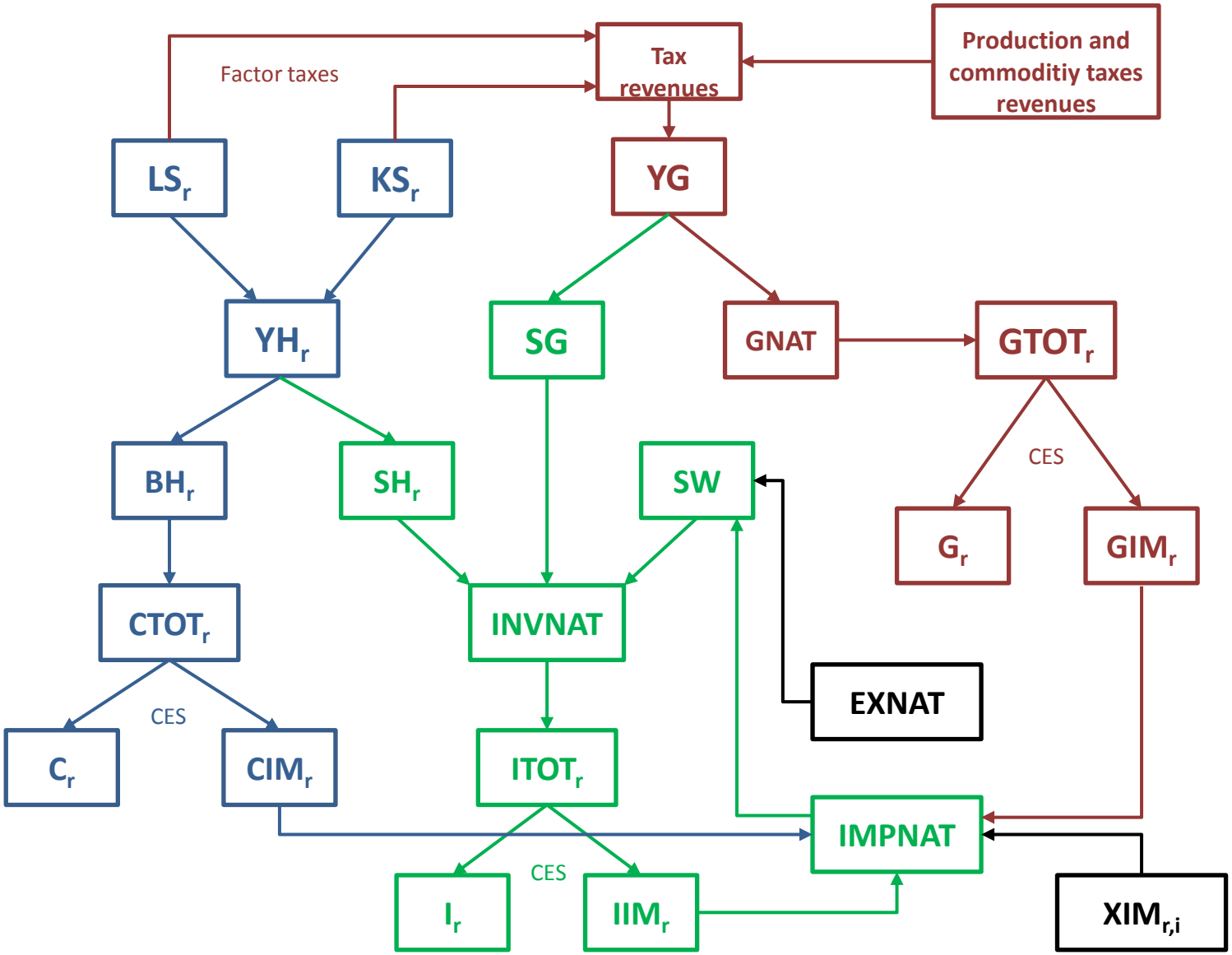
The regional SCGE block

- A recursive dynamic **multisectoral** spatial computable general equilibrium model
- **Spatial:**
  - Transportation cost (iceberg)
  - Interregional trade
  - Labour migration
  - Interregional capital re-allocation
- **General equilibrium:**
  - Utility maximazing households
  - Investment decisions
  - Government optimization
  - Production side (perfect competition)
  - Foreign markets (partially exogenous)
- **Model features**: it runs in GAMS, calibated for 2010 with an estimated Hungarian multiregional input-output table for 20 Hungarian NUTS 3 regions and 39 NACE rev 2 industries

Production


LS_r
Equilibrium condition
L_r,i
K_r,i
CET
KS_r
CES
XINT_r,i
VA_r,i
Leontief
XIM_r,i
XR_r,i
CES
X_r,i
CET
EX_r,i
D_r,i
Equilibrium condition
QR_r,q,i
CET
Q_q,i
Equilibrium condition
CR_q,i
IR_q,i
GR_q,i
XIR_q,i, j

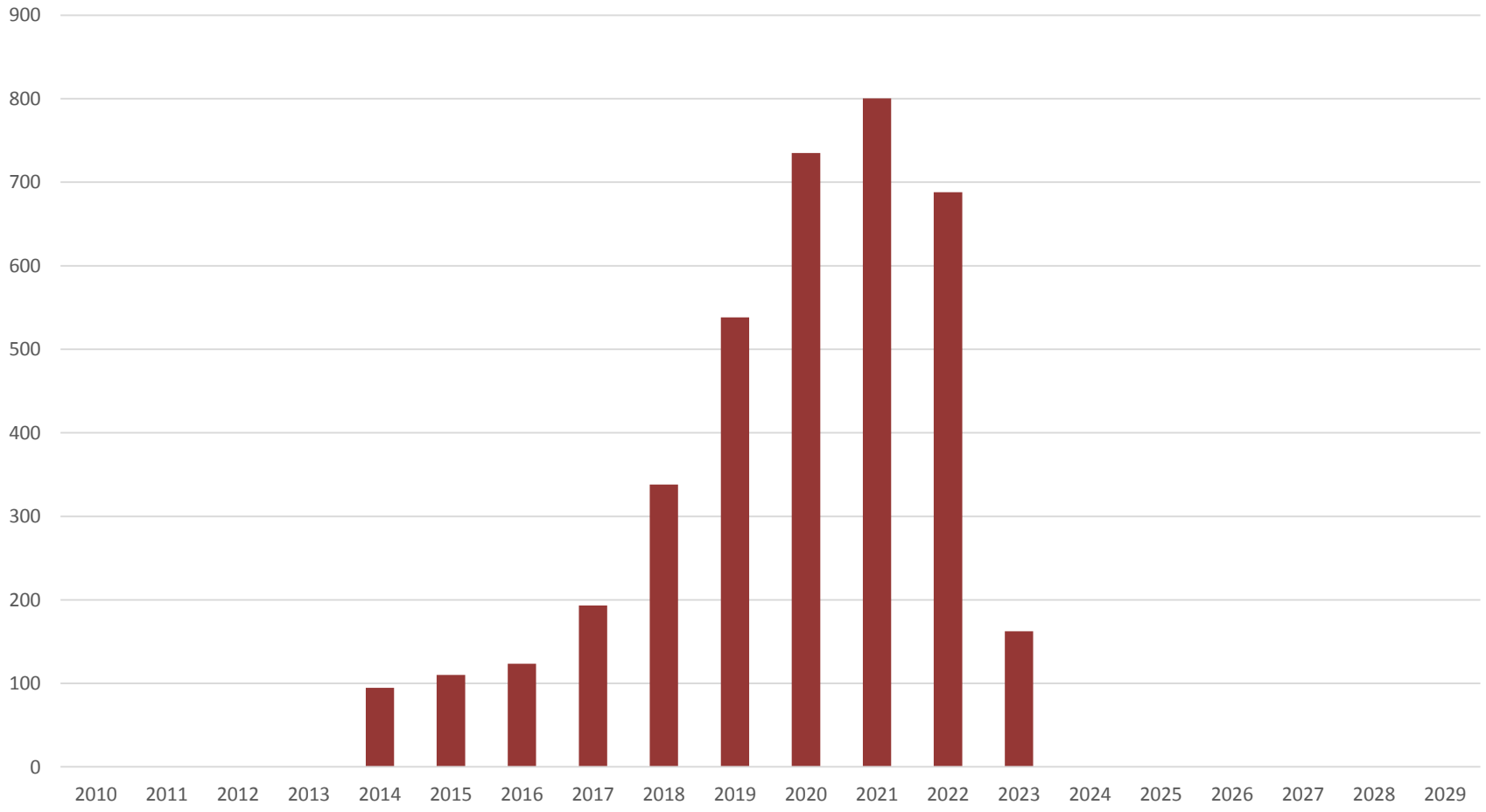
Demand


Factor taxes
Tax revenues
Production and commoditiy taxes revenues
LS$_r$
KS$_r$
YG
YH$_r$
SG
GNAT
GTOT$_r$
BH$_r$
SH$_r$
SW
CES
G$_r$
GIM$_r$
CTOT$_r$
INVNAT
EXNAT
CES
C$_r$
CIM$_r$
ITOT$_r$
IMPNAT
CES
I$_r$
IIM$_r$
XIM$_{r,i}$

Illustrative policy simulations

- Example: applications in Hungarian regions and industries
- Based on available funds for regions and an estimated time schedule for investment between 2014 and 2023
- Data collected from EU Commission, Hungarian EMIR database
- Total funding: 25 billion EUR
- Only considered „physical investments” for the period between 2014-2020 (~1150 m EUR)
- For physical investment for the competitiveness of producers: 320 million EUR
- In the simulations we allocated **12 million EUR** for each regionally highly embedded industrial sector in each region

Investment shocks to the selected industries (Million HUF)



Selection of industrial sectors for smart specialisation

- McCann - Ortega-Argilés (2015): a specilisation is smart if the region diversifies into sectors which are closely related to the dominant (i.e., highly embedded) industries of the region. This results in high regional knowledge spillovers.
- The density of input-output linkages with the rest of the region's industries measures embeddedness in this context
- We measure embeddeddness by the concept of network centrality
- Centrality: how central, how important a given node is within the network
- Different centrality measures exist: degree, closeness, betweenness, etc.

Selection of industrial sectors for smart specialisation

- Connection to input-output analysis
  - An IO table describes the structure of the network where nodes are sectors and connections are product flows between these sectors

- We apply the Eigenvector centrality measure[2]
  - The centrality score of a given node depends on the centrality score of its neighbours
  - This is a comprehensive measure of centrality, showing the *importance* of a node, not simply the *number of its links* (degree) or *location* within the network (closeness)
  - In an indirect way it captures the structure of the whole network

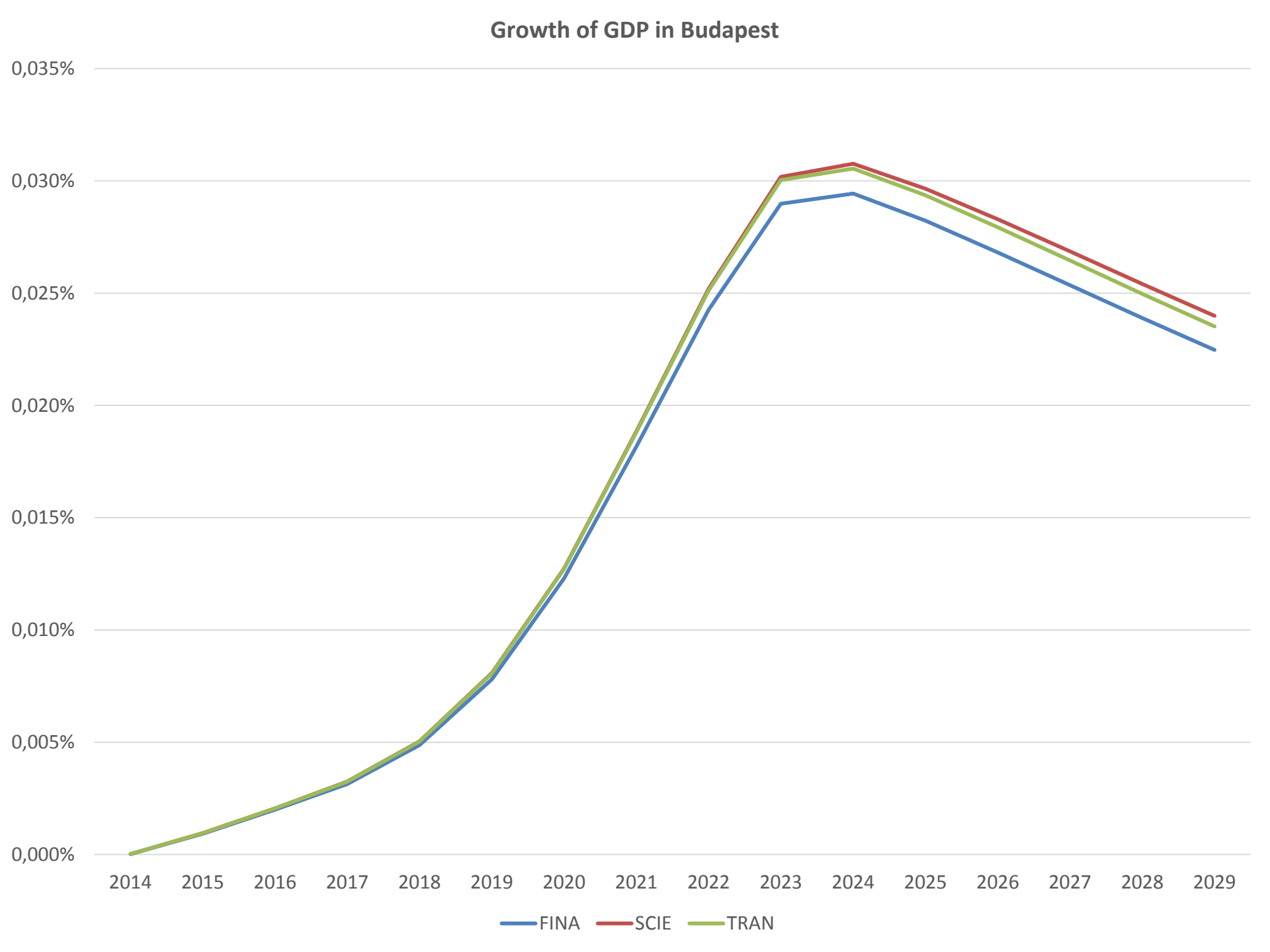
[2] Bonacich (1972), Bonacich (2007)

The most embedded (central) sectors selected

- Baranya
  - Agriculture
  - Electricity, gas, steam and air conditioning supply
  - Public administration and defense; compulsory social security
- Budapest
  - Financial and insurance activities
  - Legal and accounting activities; activities of head offices; management consultancy activities and architectural and engineering activities; technical testing and analysis
  - Transportation and storage
- Győr-Moson-Sopron
  - Electricity, gas, steam and air conditioning supply
  - Real estate activities
  - Manufacture of motorvehicles and other transport equipments

The smart specialisation simulations

- The government's problem: selection of one discovery (an innovative idea) for each region to support from the set of discoveries suggested by entrepreneurs
- In the first stage governments select those discoveries that diversify the three most embedded sectors (following McCann - Ortega Argilés 2015)
- Then there is a need for economic impact assessments in order to select the final discovery for each region
- In the GMR-simulations we assume that the same amount of public venture capital investment is needed for the support of each discovery
- We run the GMR-Hungary model to estimate the GDP impacts of alternative investment supports
- The model calculates regional and national effects of the alternative policies


Growth of GDP in Budapest
0,035%
0,030%
0,025%
0,020%
0,015%
0,010%
0,005%
0,000%
2014
2015
2016
2017
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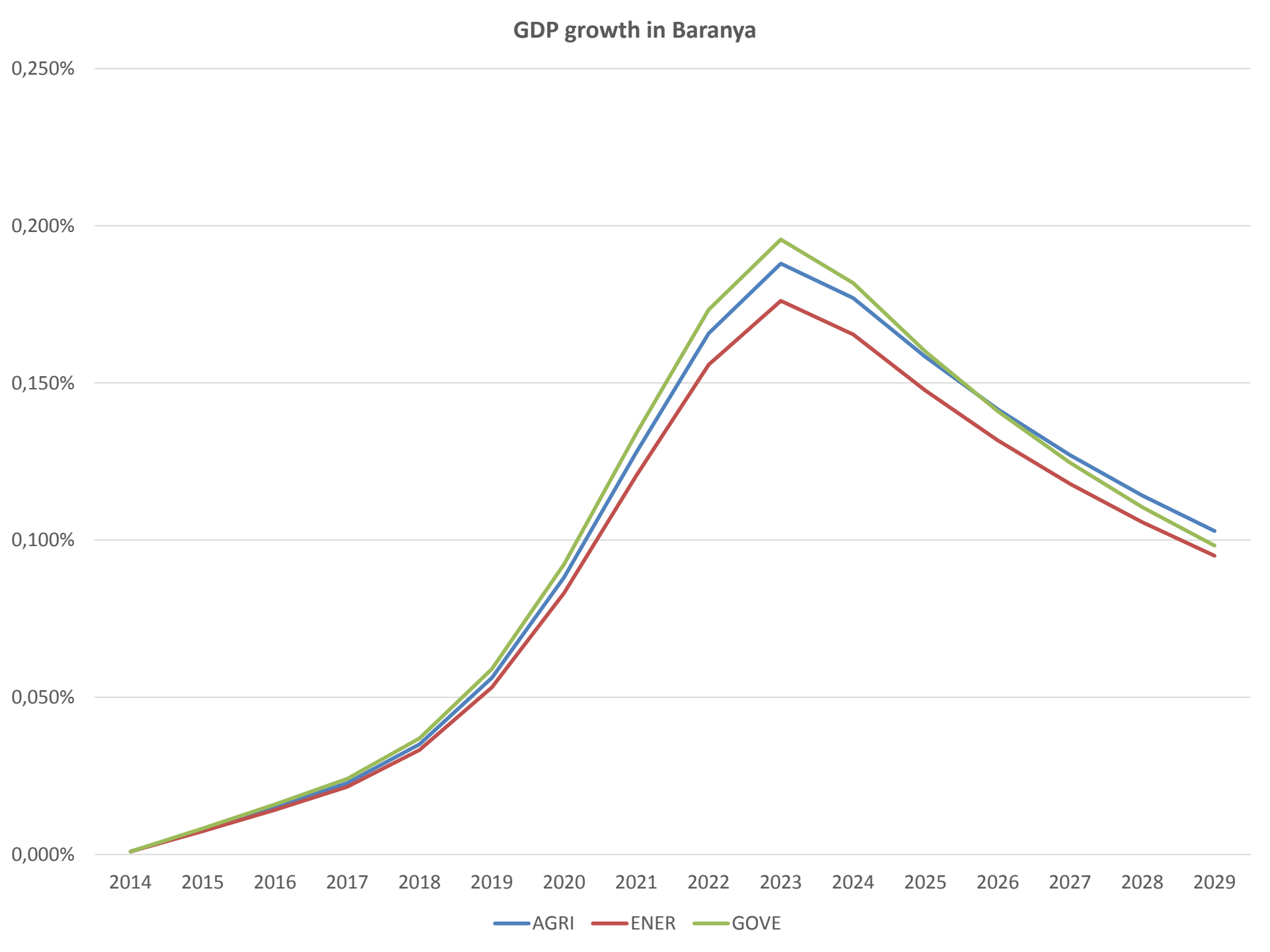
FINA
SCIE
TRAN


GDP growth in Baranya
0,250%
0,200%
0,150%
0,100%
0,050%
0,000%
2014
2015
2016
2017
2018
2019
2020
2021
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2025
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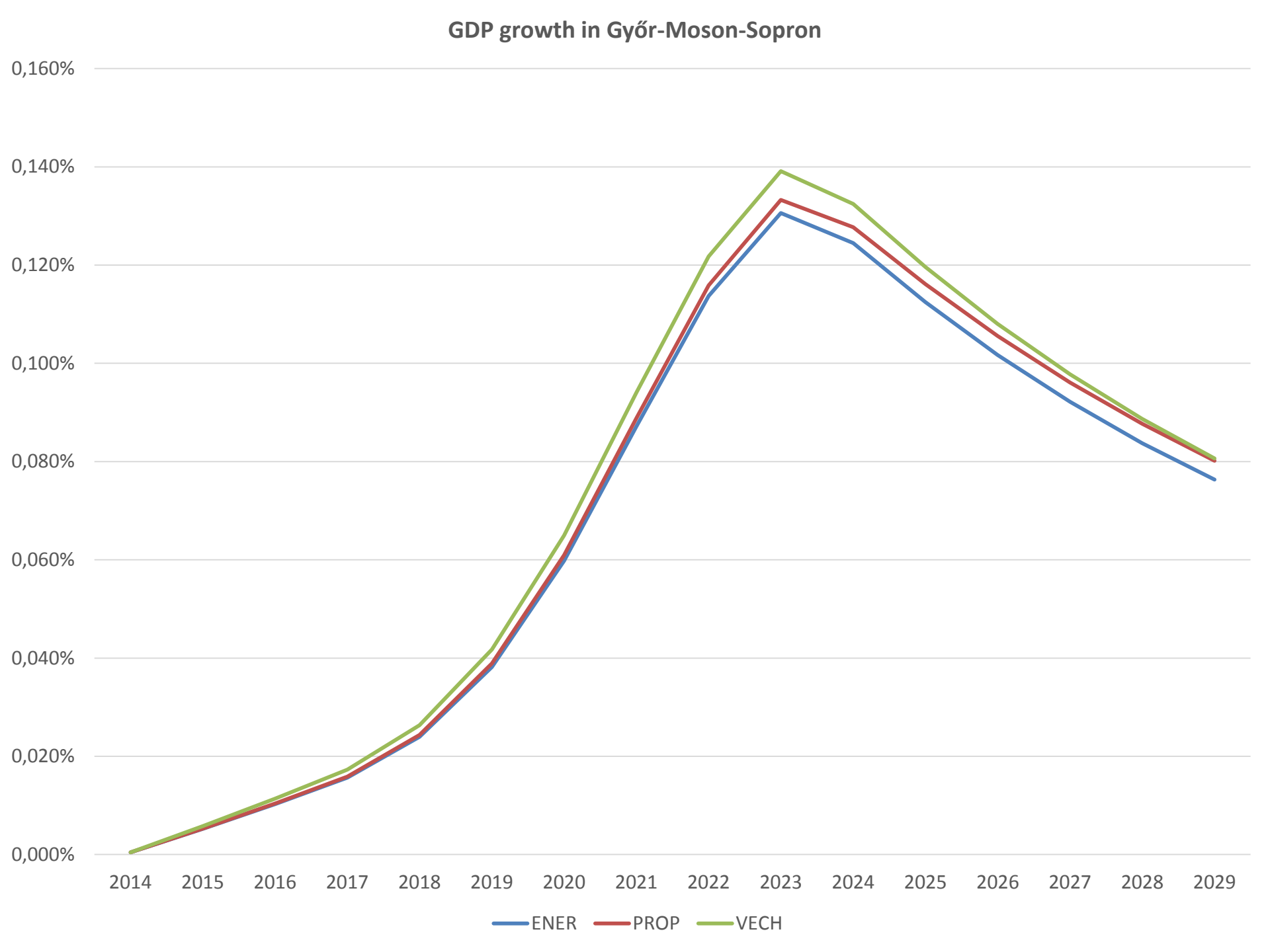
2028
2029
AGRI
ENER
GOVE


GDP growth in Győr-Moson-Sopron
0,160%
0,140%
0,120%
0,100%
0,080%
0,060%
0,040%
0,020%
0,000%
2014
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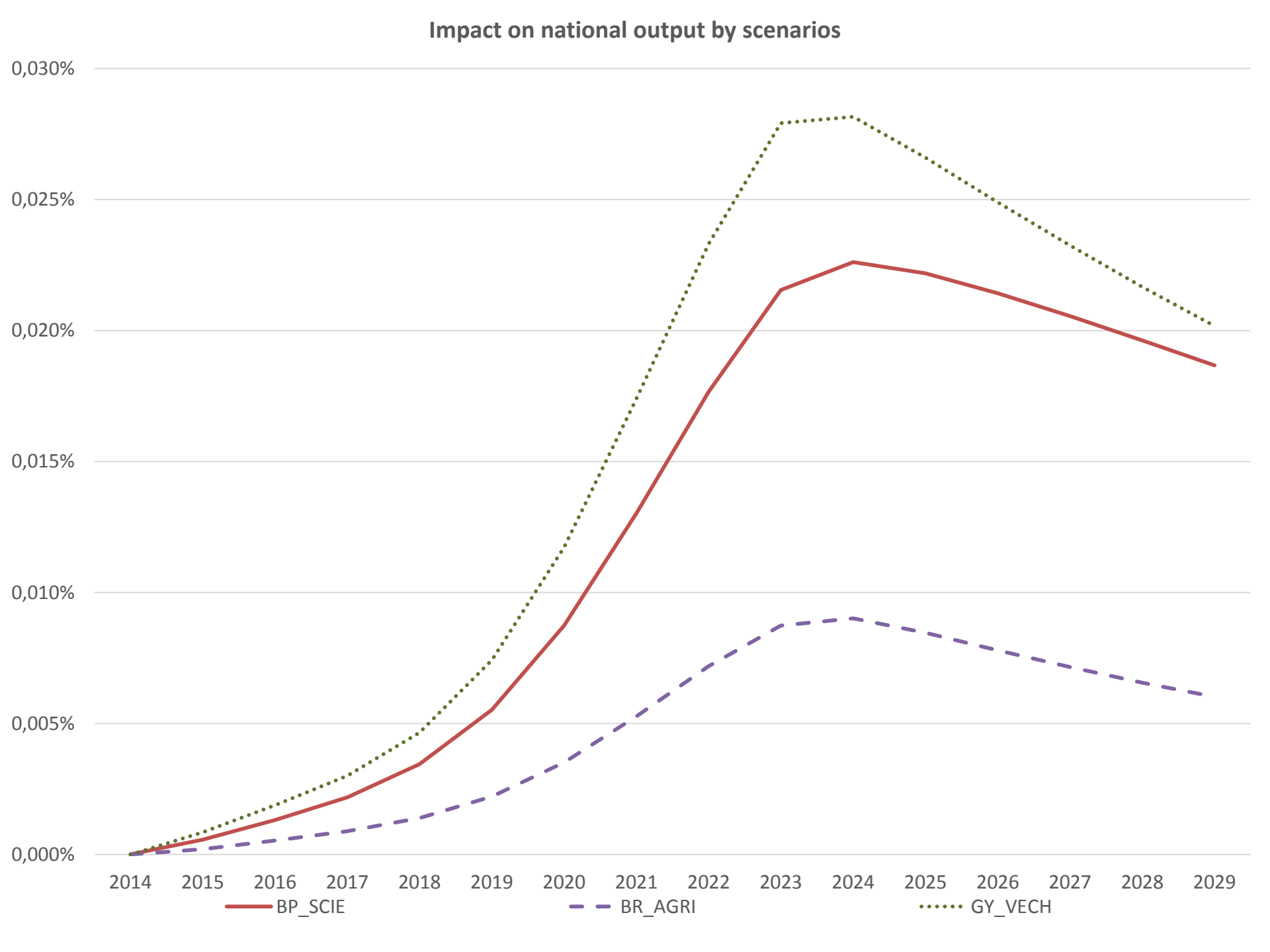
PROP
VECH


Impact on national output by scenarios
0,030%
0,025%
0,020%
0,015%
0,010%
0,005%
0,000%
2014
2015
2016
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2019
2020
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2025
2026
2027
2028
2029
BP_SCIE
BR_AGRI
GY_VECH

Summary

- Economic impact assessment plays a central role in S3 prioritisation
- Economic effects estimated on the basis of ‘backward linkages’ are narrow compared to the full set of impacts - economic models estimate much broader impacts
- Illustrative smart specialisation policy impact assessments with the GMR-Hungary economic model
- The estimation of comparable regional, industrial and macroeconomic effects of alternative smart specialisation policies generate important information for policy makers

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